

Mycology of Onychomycosis: A 5-year retrospective review (2011 – 2015) in Hospital Kuala Lumpur

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ABSTRACT

Onychomycosis is a common nail disease with numerous etiological pathogens. In order to determine and trend the local mycological pattern of culture-positive diseased nail samples sent from the Department of Dermatology, Hospital Kuala Lumpur, a five-year retrospective audit was carried out, which revealed that non-dermatophyte molds were the predominant fungi isolated, followed by yeasts and dermatophytes. This is similar to two previous studies in Malaysia, but varies greatly from other studies around the world which showed a dermatophyte-predominant prevalence. This could be due to the nature of the environment our patients encountered.

INTRODUCTION

Onychomycosis is the most frequently encountered nail disease with numerous etiological pathogens such as dermatophytes, yeasts and molds. It is oftentimes challenging to treat. Thus, in order to tailor appropriate treatment, we sought to determine the local mycological pattern of onychomycosis presenting to our center by carrying out a five-year retrospective audit on 1,357 positive fungal nail cultures in the Department of Dermatology, Hospital Kuala Lumpur, between 2011 and 2015.

We found that molds represented 69.3% of the positive fungal nail cultures, followed by yeasts (22.3%) and dermatophytes (7.4%) as shown in Figure 1.

Trichophyton tonsurans (35/101), Trichophyton rubrum (28/101) and Trichophyton mentagrophytes (16/101) were main dermatophytes isolated. NDMs isolated were predominantly Aspergillus niger (245/941), Fusarium species (234/941), and Penicillium species (140/941), while yeasts were mainly Candida species (130/302) and Trichosporon species (90/302).

Previous studies in other parts of the world revealed a dermatophyte-^{1,2} or yeast-³ predominant prevalence. However, studies in Malaysia consistently showed that NDMs were the predominant fungi isolated in onychomycosis^{4,5} (Table I). Initially thought to be contaminants, molds are now considered to be emerging pathogens of onychomycosis by many authors including Gupta, et al⁶ and Nenoff, et al⁷. Some NDMs are perhaps a causative agent of onychomycosis in this region mainly because of the nature of the

environment and/or occupation the patients encountered, such as close contact with soil, the habit of walking barefoot, frequent immersion of hands in water, and a hot, humid climate. True NDM onychomycosis is generally more difficult to eradicate and resistant to the usual oral anti-fungals. Apart from azole antifungals, terbinafine may be an effective treatment for molds too.⁶

On the other hand, the high prevalence of mold isolated in our cohort could also possibly indicate improper sampling methods. Interestingly, the direct microscopic examination of non-dermatophytic molds onychomycosis has been shown to yield a high false negative result of more than 42%.⁸ Therefore, a proper mycological culture is mandatory for all clinically suspected onychomycosis.⁸ As described in previous studies, micro-drilling, proximal sampling, and subungual curettage⁹ yield better results than simple nail clipping. The quantity of the material obtained from the nail and the location from which the sample is taken greatly affects the culture result. The common practice in many local centers is distal nail clipping, which may result in a high prevalence of contaminants. The high prevalence of contamination can be effectively reduced by the simple practice of cleaning the entire nail plate, free edge of distal nail and hyponychium with an alcohol swab before clipping the distal end with a sterile nail-clipper, and the nail specimen sent to the microbiology laboratory in either a sterile urine container or placed in a clean, folded piece of paper and labelled accordingly. While a micro-drill may not be readily available in most government outpatient clinics, simple curettage of the thickened subungual portion of the nail using a standard curette would still yield better results. If a curette is not available, scraping of the thickened nail plate with a no. 15 scalpel blade is also acceptable, with the nail scraping specimen sent to the laboratory using the methods described above. Better sampling technique as well as strict adherence to diagnostic criteria of onychomycosis in future audits will no doubt aid in providing more accurate epidemiological data.

Trichosporon species was the second commonest yeast species isolated from our cohort after Candida species. Trichosporon has traditionally not been considered pathogenic, however there have been many recent case reports claiming its pathogenic potential, including Trichosporon ovoides, which has been reported as an emerging pathogen by de Magalhaes, et al in both immunocompromised as well as

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Table I: Comparison of studies on the causative pathogen of onychomycosis

	Dhib I., et al Sousse, Tunisia 1986-2007	Ng K. P., et al UMMC, Malaysia 1996-1998	Godoy-Martinez P., et al Sao Paulo, Brazil 1996-1999	Hilmioglu-Polat S., et al Izmir, Turkey 2001-2003	Lau S. L., et al UMMC, Malaysia 2004-2008	Ramalingam R., et al HKL, Malaysia 2011-2015
No. of isolates	5,789	500	175	374	215	1,357
Dermatophytes	Total: 2,887 (49.9%) T. rubrum: 2,512 (87.0%) T. violaceum: 237 (8.2%) T. mentagrophytes: 118 (4.1%)	Total: 2,887 (49.9%) T. rubrum: 118 (64.5%) T. mentagrophytes: 62 (33.9%) Malbranchea sp.: 2 (1.1%)	Total: 71 (40.6%) T. rubrum: 58 (81.7%) T. mentagrophytes: 11 (15.5%) T. tonsurans: 1 (1.4%)	Total: 175 (48%) NA	Total: 3 (1.4%) Trichophyton sp.: 2 (66.7%) M. nanum: 1 (33.3%)	Total: 101 (7.4%) T. tonsurans: 35 (34.6%) T. rubrum: 28 (27.7%) T. mentagrophytes: 16 (15.8%)
Molds	Total: 157 (2.7%) A. flavus: 29 (18.5%) Chrysosporium sp.: 24 (15.3%) Aspergillus sp.: 23 (14.6%)	Total: 182 (36.4%) A. niger: 63 (34.6%) A. fumigatus: 30 (16.5%) H. toruloidea: 27 (14.8%)	Total: 13 (7.4%) F. oxysporum: 4 (30.7%) N. mangiferae: 4 (30.7%) Fusarium sp.: 2 (15.4%) F. solani: 2 (15.4%)	Total: 33 (9%) A. niger: 7 (22%) Acremonium sp.: 6 (18%) Fusarium sp.: 6 (18%)	Total: 147 (68.4%) Aspergillus sp.: 49 (33.3%) Fusarium sp.: 22 (15.0%) S. dimidiatum: 20 (13.6%)	Total: 941 (69.3%) A. niger: 245 (26.0%) Fusarium sp.: 234 (24.9%) Penicillium sp.: 140 (14.9%)
Yeasts	Total: 2,745 (47.4%) C. albicans: 1,206 (43.9%) C. parapsilosis: 752 (27.4%) C. tropicalis: 369 (13.4%)	Total: 136 (27.2%) C. albicans: 132 (97.1%) C. parapsilosis: 3 (2.2%) C. tropicalis: 1 (0.7%)	Total: 91 (52.0%) C. albicans: 32 (35.2%) C. albicans: 32 (35.2%) Candida sp.: 11 (12.1%)	Total: 150 (41%) NA	Total: 65 (30.2%) C. parapsilosis: 39 (60%) C. albicans: 15 (23.1%) C. tropicalis: 1 (1.5%)	Total: 302 (22.3%) Candida sp.: 130 (43.0%) Trichosporon sp.: 90 (29.8%) C. albicans: 58 (19.2%)

T. rubrum: Trichophyton rubrum; T. violaceum: Trichophyton violaceum; T. mentagrophytes: Trichophyton mentagrophytes; T. tonsurans: Trichophyton tonsurans; E. floccosum: Epidermophyton floccosum; M. nanum: Microsporium nanum; A. flavus: Aspergillus flavus; A. niger: Aspergillus niger; A. fumigatus: Aspergillus fumigatus; H. toruloidea: Hendersonula toruloidea; F. oxysporum: Fusarium oxysporum; F. solani: Fusarium solani; N. mangiferae: Nattrassia mangiferae; S. dimidiatum: Scytalidium dimidiatum; C. albicans: Candida albicans; C. parapsilosis: Candida parapsilosis; C. tropicalis: Candida tropicalis; C. guilliermondii: Candida guilliermondii; C. famata: Candida famata; UMMC: University Malaya Medical Center; HKL: Hospital Kuala Lumpur; NA – not available

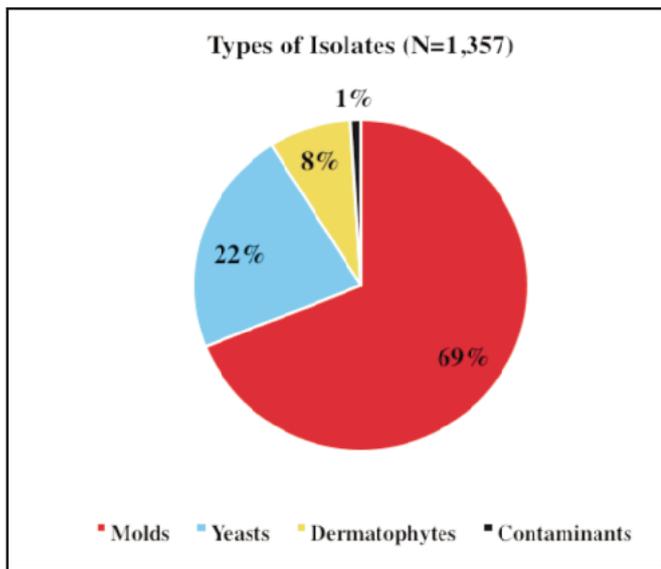


Fig. 1: Types of fungi isolated from diseased nails.

immunocompetent hosts.¹⁰ Unfortunately, our laboratory was unable to identify the exact species of this genus of yeast.

The utilization of polymerase chain reaction (PCR) for a more accurate identification of fungal species could also be considered in future studies. Current commercially available kits mainly target dermatophyte identification and none are widely available for mold.

There are many limitations to our study. Therefore, we advocate proper prospective studies in the future to address mycological patterns of onychomycosis with important associated factors such as gender, ethnicity, comorbidity, occupation, social habits, medication usage, site of involvement (fingernails vs toenails), as well as proper nail sampling techniques and strict adherence to the diagnostic criteria for non-dermatophyte onychomycosis.

In conclusion, NDMs were found to be the predominant fungi isolated from diseased nails in our cohort, followed by yeasts and dermatophytes.

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REFERENCES

1. Dhib I, Fathallah A, Yaacoub A, Zemni R, Gaha R, Said M. B. Clinical and mycological features of onychomycosis in central Tunisia: a 22 years retrospective study (1986–2007) *Mycoses* 2013; 56: 273-80.
2. Hilmioglu-Polat S, Metin D. Y., Inci R., Dereli T., Kilinc I., Tumbay E. Non-dermatophytic molds as agents of onychomycosis in Izmir, Turkey – a prospective study. *Mycopathologia* 2005; 160: 125-8.
3. Godoy-Martinez P., Nunes F. G., Tomimori-Yamashita J., Urrutia M., Zaror L., Silva V., Fischman O. Onychomycosis in Sao Paulo, Brazil. *Mycopathologia* 2009; 168: 111-6.
4. Ng K. P., Saw T. L., Madasamy M., Soo-Hoo T. S. Onychomycosis in Malaysia. *Mycopathologia* 1999; 147: 29-32.
5. Lau S. L., Wong S. M. A 5-year retrospective study on onychomycosis and its causative organisms in University Malaya Medical Center. *Malaysian J Dermatol* 2009 (23): 11-5.
6. Gupta A. K., Drummond-Main C., Cooper E. A., Brintnell W., Piraccini B. M., Tosti A. Systematic review of nondermatophyte mold onychomycosis: Diagnosis, clinical types, epidemiology, and treatment. *J Am Acad Dermatol* 2012; 66(3): 494-502.
7. Nenoff P., Kruger C., Ginter-Hanselmeyer G., Tietz H. J. Mycology – an update. Part 1: Dermatophytes: Causative agents, epidemiology and pathogenesis. *J German Soc Dermatol* 2014; 188-210.
8. Mallardo E., Vitiello M., Martora F., Folgore A., Giordano B., Pilloni P., Galdiero M., Iovene M. R. Non-dermatophytic Onychomycosis Diagnostic Criteria: An Unresolved Question. *Mycoses* 2016; 59: 558-65.
9. Shemer A., Trau H., Davidovici B., Grunwald M. H., Amichal B. Comparative study of nail sampling techniques in onychomycosis. *J Dermatol* 2009; 36: 410-14.
10. de Magalhaes A. R., de Mondino S. S. B., da Rocha E. M. S., Nishikawa M. M., de Macedo H. W., de Souza-Baptista A. R. Trichosporon isolation from human ungueal infections: is there a pathogenic role? *Ans Bras Dermatol* 2016; 91(2): 173-9.